DOCUMENT RESUME

ED 250 134 RC 015 017

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TITLE The Impacts of the Age-Structure of Net Migration on the Economic and Socioeconomic Characteristics of Texas Counties, 1960-1980.
PUB DATE Aug 84
NOTE 25p.; Paper presented at the Annual Meeting of the Rural Sociological Society (47th, College Station, TX, August 22-25, 1984).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Age Groups; Change; *Cluster Analysis; Data Analysis; Economic Factors; *Migration Patterns; Population Distribution; *Population Trends; Rural Population; Rural to Urban Migration; *Socioeconomic Influences; Trend Analysis; Urban to Rural Migration
IDENTIFIERS *Counties; Impact; *Texas

ABSTRACT

This analysis addresses the need for including age-structure effects in migration analysis as important for determining effects of a demographic process on an area's socioeconomic characteristics. It examines: (1) patterns of age-specific net migration across age groups for Texas' 254 counties in 1960-1970 and 1970-1980 using cluster analysis and, (2) the alternative and relative effects of total net migration, net migration for 16 separate age groups, and clusters representing different patterns of age-specific net migration across ages on selected economic and socioeconomic characteristics of Texas counties in 1970 and 1980 and on changes in such characteristics during 1960-1970 and 1970-1980. Results are presented in four tables. Tables 1 and 2 show means and standard deviations of each age-specific net migration rate for individual clusters identified for the two time periods and verify the large inmigration to Texas in the 1970's. Tables 3 and 4 show effects of net migration on counties' economic and socioeconomic characteristics. Results indicate there are age-structure effects independent of the effects of either total net migration or migration for individual age groups. Although the ability to predict may be less with clusters, their use may provide greater understanding of effects of the migration process on origin and destination areas. (NEC)

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Paper prepared for presentation at the 47th annual meeting of the Rural Sociological Society, August 22-25, 1984, College Station, Texas.

RC015017

Abstract

The Impacts of the Age-Structure of Net Migration on the Economic and Socioeconomic Characteristics of Counties

by

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Although migration has tended historically to be selective of young adults, the patterns of age-specific migration appear to be changing rapidly. At the same time, there are apparently substantial changes occurring in the relationships between age-specific migration and economic and socioeconomic factors within areas of origin and destination. For example, evidence from the migration turnaround literature indicates that many nonmetropolitan areas that are growing in total population continue to lose young adults in their most productive ages and thus continue to lose more human capital than they are gaining as a result of migration. Assessment of the total pattern of age-specific migration in an area appears to be essential if the impacts of migration on an area are to be identified.

Empirical analyses of the impacts of migration on areas, however, have tended to employ either the total net migration rate or age-specific migration rates for various ages as separate independent variables. The effects of the total structure of migration patterns across age groups have seldom been examined despite the fact that the total structure of demographic phenomena across ages is clearly recognized as important in determining the effects of a demographic process on an area's socioeconomic characteristics. There is thus a clear need for the inclusion of age-structure effects in migration analysis.

The analysis reported in this paper addresses this need. It examines: (1) the patterns of age-specific net migration across age groups for Texas' 254 counties in 1960-70 and 1970-80 using cluster analysis and; (2) the alternative and relative effects of total net migration, net migration for 16 separate age groups, and clusters representing different patterns of age-specific net migration across ages on selected economic and socioeconomic characteristics of Texas counties in 1970 and 1980 and on changes in such characteristics from 1960 to 1970 and from 1970 to 1980.

The results of the analysis indicate that there are age-structure effects that are independent of the effects of either total net migration or migration for individual age groups. The results thus suggest that concerted attempts should be made in subsequent analyses to examine the total pattern of age-structure effects in analysis of the effects of migration.

The Impacts of the Age-Structure of Net Migration on the Economic and Socioeconomic Characteristics of Texas Counties, 1960-1980

The impacts of migration on areas of origin and destination have received extensive attention in the demographic (Bowles, 1978; Zuiches and Brown, 1978; Lichter et al., 1979) and rural sociological (Schwarzweller, 1979) literature. The effects of migration on service usage (DeJong and Donnelly, 1973), on the pool of future intellectual talent in developing areas (DeJong and Gardner, 1981) and on social and occupational mobility (Willitis et al., 1978) are among the many effects of migration that have been examined.

A majority of such analyses, however, have focused on the effects of total net migration patterns, or of specific age groups, [such as young adults (Schwarzweller et al., 1971) or the elderly (Beegle and McNamara, 1978)] on social and economic characteristics of sending or receiving areas. Relatively few analyses have examined the effect of different age structure forms of migration on the characteristics of origin and destination areas. For example, there have been few attempts to assess how the social and economic characteristics of areas with high levels of outmigration among young adults coupled with high levels of inmigration for middle-age and elderly persons will be affected compared to areas with inmigration or outmigration at all ages. There have been even fewer attempts to analyze such patterns at the substate level and to compare changes in the effects of such patterns over time.

The failure to examine the effects of the age structure of migration on social and economic factors is somewhat surprising because of the extensive literature establishing the importance of patterns of demographic processes across ages in the determination of demographic effects (Bogue, 1969; Peterson, 1973; Nam and Philliber, 1984). Thus, it is widely recognized that it is essential to examine fertility (Bogue, 1969) and mortality (Kitagawa, 1977) patterns across age groups (rather than crude rates or rates for single age groups) in order to adequately determine the effects of fertility and mortally on an area of interest. Although few analyses of migration have attempted to assess such structure affects, the importance of such analysis is evident.

Such analyses are difficult to perform, however, because there are simply few measures, other than total net migration rates, that provide an overall measure of a population's level of migration and total rates can result from widely different age-specific patterns. Age-specific rates allow age structure differences to be assessed, but there is no convenient way to measure the relative effects of different combinations of such rates. It is possible, however, to classify areas in terms of their patterns of migration across ages in given periods of time and to examine the social and economic conditions that are prevalent at subsequent periods of time. Although care must be taken in such analyses to eliminate the effects of extraneous effects, such an analysis can be used to at least partially

identify the effects of different age structures of migration on the characteristics of areas.

This paper presents such an analysis for Texas' 254 counties in 1960-1970 and 1970-1980. The analysis first constructs clusters of counties with different structures of migration from 1960-1970 and from 1970-1980. The effects of such clusters on the social and economic characteristics of counties in 1970 and 1980 are then examined and the relative effects of cluster measures of the age structure of migration are compared to those for the total net migration rate and 16 age-specific migration rates. The analysis presented, thus, provides both a description of the age structure of migration in Texas counties in 1960-1970 and 1970-1980 and assesses the importance of such structures in predicting the impacts of migration on counties' social and economic characteristics.

Methodology

To complete the analysis, several data sources were used. For the independent variables, 1960-1970 age-specific and total net migration rates were obtained from Bowles et al. (1975). For 1970-1980 age-specific and total net migration rates were computed by the Department of Rural Sociology at Texas A&M University using the same methods as used by Bowles et al for 1960-1970. The dependent variables include several economic and socioeconomic characteristics of Texas counties. These variables were obtained from a historical data file generated at the Department of Rural Sociology at Texas A&M University. This file

combines data from the Censuses of Population, Housing, Governments and Businesses for the 1960s and the 1970s.

The importance of the age structure of net migration and their impacts on socioeconomic characteristics are assessed by comparing the explanatory power of three different measures of net migration, total net migration, migration clusters, and 16 age-specific net migration rates. Migration clusters were arrived at by assigning counties with similar patterns of age-specific net migration to distinct clusters using cluster analysis. Five clusters were used for 1960-1970 and four for 1970-1980. These clusters were coded as dummy variables for use in the regression analyses described below.

The impacts of net migration on counties' economic and socioeconomic characteristics were assessed in two ways. First, selected county characteristics in 1970 and 1980 were regressed on the three different measures of net migration for the respective preceding decades (1970 on 1960-1970 and 1980 on 1970-1980). The second method examined county characteristics in 1970 and 1980 net of regression effect at the beginning of the respective decades (1960 for the 1970 end period and 1970 for the 1980 end period) (Markus, 1979). This was done using a two-stage regression procedure. First, the residuals of each characteristic were obtained by regressing the value of characteristics at the end of each decade on their values at the beginning of the decade. The residuals so obtained were then used as dependent variables in the second stage of the analysis

in which these residuals were regressed on the three alternative measures of migration. This second approach allows the effects of historical trends in such characteristics to be differentiated from those changes likely to have been caused by migration and similar factors.

Results

The analysis is presented in two parts. First, the results of a cluster analysis of 16 age-specific net migration rates for each of the 254 counties for two time periods (1960-1970, 1970-1980) is presented. The purpose of this analysis was to identify different age patterns of net migration. In the second part of the analysis the effects of net migration on counties' economic and socioeconomic characteristics are assessed using three different measures of net migration. Emphasis in the second part of the analysis is on evaluating the relative merits of the different measures of net migration.

Tables 1 and 2 present the results of the cluster analysis. These tables show the means and standard deviations of each of the age-specific net migration rates for the individual clusters identified for the two time periods. As shown in Table 1, in the 1960-1970 period Texas' 254 counties were clustered into 5 groups using disjoint cluster analysis. Counties that are most similar in their age-specific net migration rates were grouped together to minimize within-cluster differences and to maximize between-cluster differences. An examination of these five clusters clearly show five unique age patterns of net migration. In

Cluster 1 a majority of the 99 counties had experienced net outmigration for age groups younger than 50 (with the exception of the very youngest age group), and inmigration for age groups older than 50. Among the age groups which had experienced net outmigration, the loss of persons between the ages of 15 and 29 was especially large.

Cluster 2 contained 11 counties, all of which were the locations of colleges and universities. These counties are characterized by very high rates of net inmigration for the 15-24 age groups and relatively high outmigration for the 25-34 age groups. Although the members of Cluster 2 also experienced net inmigration for age groups older than 40, the mean net inmigration rates are relatively low. The net outmigration of the two very youngest age-groups is likely a result of children leaving the area with their parents after the parents have completed college. Clusters 3 and 4 are composed of two groups of counties having opposite net migration experiences. The counties in Cluster 3 experienced net inmigration for all age groups, whereas those in Cluster 4 experienced net outmigration for all age groups. Almost all of the counties in Cluster 3 are large metropolitan counties that have experienced rapid population growth in the 1960s, as well as in the 1970s. Cluster 5 contains 47 counties and shows a distinct pattern having relatively high rates of net outmigration for persons 20-29, but relatively high rates of net inmigration for all other age groups. An overall R^2 of .62 indicates that the five migration

clusters explained 62% of the overall variance in the 16 age-specific net migration rates during the 1960-1970 period. Overall, then, the five clusters for 1960-1970 point to distinct and readily interpretable patterns of migration.

Table 2 presents the results of the cluster analysis for the 1970-1980 period. Cluster 1 for this period is similar to Cluster 5 in Table 1. It is characterized by low rates of net outmigration for persons 20-29, and high rates of net inmigration for all other age groups. Cluster 2 contains a majority of the counties in the State. The patterns of net migration in this cluster point to a pattern of outmigration among young adults in the age groups of 15-29 with very low rates of inmigration in other age groups. An examination of the counties in this cluster suggest that many of these are rural turnaround counties that continue to lose young adults to urban areas but have begun to gain population at other ages. Cluster 3 is almost an exact replication of Cluster 3 in Table 1. Again, the pattern in this cluster is one in which no age group has experienced net outmigration. The rate of net inmigration in the 1970s were, however, generally higher than those for the previous decade (the one exception was the 20-24 age group). Cluster 4 contains only one county (Hood) that is dominated by a large military base and experienced extensive net inmigration for all age groups. This county is grouped together with those in Cluster 3 in subsequent parts of analysis because the between-cluster difference between these two clusters is smaller than that between Cluster 4 and

other clusters. Cluster 5 contains 11 counties that experienced relatively heavy net inmigration during the 1970s for all age groups except 30-34. An examination of the counties in this cluster indicates that these are nearly the same group of counties (only 2 were different) as were in Cluster 2 in 1960-1970.

A comparison of the results in Tables 1 and 2 and an examination of the counties contained in each cluster in the two time periods clearly verify distinct patterns in Texas migration. Thus, they point to the very large net inmigration to Texas in the 1970s compared to the 1960s. As the clusters in Table 2 indicate relatively few counties were still experiencing net outmigration in the 1970s. Thus, the migration turnaround in Texas (Skrabanek et al., 1984) is clearly evident in the data in these tables.

Perhaps more important, however, is the fact that a majority of the clusters are identifiable and interpretable. Thus, Cluster 1 in the 1960-1970 period was largely composed of nonmetropolitan counties in the process of making the transition from net outmigration to net inmigration. Cluster 2 in 1960-1970 consisted of college-dominated counties. Clusters 3 and 5 consisted largely of metropolitan counties experiencing either rapid net inmigration in all age groups (Cluster 3) or with some net outmigration of young adults and high rates of inmigration at other ages. Cluster 4 consisted largely of nonmetropolitan counties experiencing historical patterns of continuous

population decline.

The clusters for 1970-1980 show similarly distinct patterns. Clusters 1 and 3 in 1970-1980 are roughly equivalent to Clusters 5 and 3 in 1960-1970 and are composed largely of relatively large urban and metropolitan counties undergoing rapid growth. Cluster 2 contains many of the same counties as were in Clusters 1 and 4 in 1960-1970 and is best described as a cluster of turnaround counties. The 1970-1980 cluster patterns, thus, show a clear continuity with those of the 1960-1970 period. The distinctness of these clusters and their continuity over time suggests that they are indicative of long-term migration processes and likely to be of importance in determining the socioeconomic characteristics of counties.

The results of the analysis of the effects of net migration on counties' economic and socioeconomic characteristics are presented in Tables 3 and 4. Table 3 shows how counties' economic and socioeconomic characteristics at two end periods (1970 and 1980) are related to three different measures of net migration for the preceding decade period. The interpretation of these data is made in two parts. A comparison of the explanatory powers of the total net migration rate versus the migration clusters is presented first, followed by a comparison of the explanatory power of the migration clusters to those of the 16 age-specific net migration rates.

A comparison of the first two columns for each time period in Table 3 indicates that migration structures are generally

better predictors of the economic and socioeconomic characteristics of counties than total net migration rates. This finding is especially evident during the 1960-1970 period in which 11 of the 13 characteristics had higher R^2 values for the clusters. In 1970-1980 the results are not as strong but 9 of the 13 characteristics were still predicted more effectively using information on migration clusters. The age structure of migration does appear to have effected the social and economic characteristics of counties.

Comparisons of the second and third columns in Table 3 for each period reveal that clusters are less effective predictors of economic and socioeconomic conditions than the 16 age-specific variables. In part this finding may simply reflect the fact that the number of independent variables (16 age groups) for the age-specific rates is much larger relative to the total size of the sample (254 counties) than for the cluster variables (4 in 1960-1970 and 3 in 1970-1980), but for all variables for both periods the R^2 for the age-specific rates are larger.

In Table 4 the results using residual measures of the dependent variables are examined. Because the use of residuals tends to control for regression effects these results may be seen as technically superior to those in Table 3. The results in Table 4 verify those in Table 3 in all regards showing stronger effects for clusters than for total net migration rates and stronger effects for age-specific rates than for clusters.

Overall, the findings in Tables 3 and 4 reaffirm that the

age structure of migration, whether measured by cluster or age-specific rates, is an essential component in the determination of the characteristics of counties in Texas. In addition, the results suggest that the use of age-specific indicators provides a better predictor of such characteristics than indicators of the total age structure of migration, as measured by clusters.

In at least one important regard, however, the use of migration clusters appears to be preferable. Whereas, as exemplified in the description of clusters provided earlier, the clusters are readily interpretable, the use of 16 age-specific rates, though highly predictive, is not readily interpretable. Thus, whereas the effects of migration on socioeconomic characteristics are interpretable given clusters of age-structure related migration pointing to turnaround county types or metropolitan county types, the same is not true when one simply knows that somehow the 16 age-specific rates for counties affect their socioeconomic characteristics. The use of clusters provides a parsimonious and interpretable means of measuring the age-structure effects of migration that is not available when numerous individual rates are employed. In sum, then, although the ability to predict may be less with clusters than with the use of specific rates, the use of clusters may provide greater understanding of the effects of the migration process on origin and destination areas.

Summary and Conclusions

The results reported here are clearly preliminary. Only one

means (cluster analysis) of measuring the total structure of migration across ages in counties was attempted, only the effects of migration on end period states of characteristics (rather than changes in such characteristics) were examined and the results are for a single state for only two periods of time. Additional analyses for other areas, longer periods of time and the utilization of additional measures and methods of analysis are clearly necessary. In particular, it appears essential to assess the relative effects of clusters of age-structure related migration controlling for age-specific rates and to further analyze the characteristics of the counties in each cluster.

The results are sufficiently promising, however, to suggest that more attention should be given to the analysis of the structure of migration across ages in addition to that for specific age groups. As with other demographic phenomena it appears that the patterns of the migration process across the ages of a population have clear implications for the socioeconomic characteristics of the area.

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Table 1: Means and Standard Deviations (in parentheses) of Age-Specific Net Migration Rates for Migration Clusters, 1960-1970

Age Group	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
0-4	1.01 (11.68)	- 4.43 (10.98)	19.92 (16.20)	- 7.99 (23.60)	9.32 (13.31)
5-9	- 1.81 (10.60)	- 3.69 (18.10)	49.43 (34.36)	-23.30 (12.48)	15.23 (10.51)
10-14	- 3.69 (7.80)	6.62 (20.80)	42.22 (28.76)	-22.12 (8.91)	18.41 (15.44)
15-19	-13.12 (10.33)	79.18 (42.10)	26.42 (17.99)	-29.29 (9.90)	9.82 (26.40)
20-24	-41.69 (20.99)	174.77 (79.55)	25.15 (40.38)	-54.62 (18.02)	-29.97 (25.98)
25-29	-34.28 (17.73)	-16.64 (22.56)	48.83 (34.38)	-46.89 (12.73)	-23.50 (19.30)
30-34	- 3.75 (12.95)	-40.39 (13.29)	67.90 (38.81)	-23.91 (12.13)	18.49 (15.76)
35-39	- 3.03 (10.32)	- 3.60 (20.53)	49.76 (38.93)	-25.57 (10.22)	20.46 (13.99)
40-44	- 2.09 (9.58)	7.31 (18.18)	38.45 (31.34)	-21.04 (10.13)	19.66 (11.43)
45-49	- 1.43 (9.16)	5.35 (17.22)	27.75 (23.77)	-18.88 (8.60)	17.29 (11.62)
50-54	0.04 (6.62)	7.44 (12.38)	25.80 (19.78)	-13.26 (10.21)	17.59 (12.77)
55-59	1.79 (6.56)	5.56 (7.92)	16.89 (15.76)	-10.55 (9.14)	18.91 (17.42)
60-64	4.85 (8.87)	9.97 (8.07)	15.39 (14.78)	- 6.47 (12.39)	25.85 (22.91)
65-69	7.50 (10.17)	7.21 (7.44)	12.54 (18.63)	- 7.47 (16.01)	25.98 (27.22)
70-74	6.25 (9.20)	7.93 (8.44)	9.75 (12.14)	- 4.23 (18.17)	18.91 (19.16)
75 +	4.44 (8.28)	4.53 (6.18)	6.60 (10.12)	- 2.94 (16.66)	11.36 (19.57)
N	99	11	12	85	47

overall R^2 = .62

Table 2: Means and Standard Deviations (in parentheses) of Age-Specific Net Migration Rates for Migration Clusters, 1970-1980

Age Group	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
0-4	13.97 (12.39)	4.71 (17.13)	32.74 (13.22)	46.96 (0)	7.66 (16.52)
5-9	29.67 (23.51)	5.43 (19.83)	86.65 (36.88)	120.17 (0)	14.54 (29.62)
10-14	37.95 (18.51)	2.70 (14.16)	122.62 (74.98)	178.68 (0)	32.07 (28.86)
15-19	23.74 (19.44)	- 6.77 (14.82)	59.89 (31.77)	147.42 (0)	126.39 (57.32)
20-24	- 8.17 (21.16)	-21.95 (24.57)	3.49 (35.60)	126.33 (0)	203.05 (102.33)
25-29	- 3.89 (28.70)	-18.26 (30.07)	52.40 (62.23)	133.06 (0)	7.96 (39.69)
30-34	54.98 (33.13)	18.45 (34.15)	181.75 (69.64)	289.59 (0)	-34.75 (24.49)
35-39	45.42 (26.08)	5.09 (20.35)	147.07 (53.29)	237.22 (0)	35.92 (33.43)
40-44	37.30 (24.90)	1.06 (15.38)	90.50 (49.86)	257.38 (0)	31.27 (23.15)
45-49	32.65 (21.15)	0.74 (17.95)	72.06 (44.67)	142.80 (0)	30.26 (21.54)
50-54	29.67 (21.55)	1.75 (16.49)	73.59 (39.97)	208.38 (0)	23.75 (22.59)
55-59	32.25 (25.46)	- 0.23 (16.28)	74.87 (44.86)	270.99 (0)	30.35 (22.38)
60-64	36.45 (30.85)	0.97 (17.38)	53.72 (44.17)	326.26 (0)	20.20 (8.39)
65-69	28.99 (28.07)	- 2.87 (17.74)	43.84 (35.25)	139.18 (0)	23.11 (13.74)
70-74	17.21 (17.81)	0.53 (19.94)	35.64 (21.75)	110.86 (0)	16.86 (11.39)
75 +	5.57 (11.91)	- 1.83 (12.66)	9.91 (19.71)	59.85 (0)	13.74 (4.97)
N	97	132	13	1	11

overall R^2 = .56

Table 3: Coefficients (r^2) and Multiple Coefficients of Determination (R^2) for Regression of Total Net Migration Rates, Migration Clusters and Age-Specific Net Migration Rates for 1960-70 and 1970-80 on Selected Social and Economic Variable Values for 1970 and 1980

Dependent Variables	1960-1970			1970-1980		
	Total Net Migration Rate	Migration Clusters	Age-Specific Net Migration Rates	Total Net Migration Rate	Migration Clusters	Age-Specific Net Migration Rates
	r^2 (r)	R^2	R^2	r^2 (r)	R^2	R^2
Number Employed	.04 (.20)*	.21*	.29*	.00 (.05)	.01	.12*
% Unemployed	.01 (-.08)	.02	.16*	.00 (.05)	.02	.25*
% Agriculture	.32 (-.57)*	.34*	.47*	.22 (-.47)*	.17*	.42*
% Marketing	.20 (.45)*	.28*	.30*	.08 (.29)*	.11*	.14*
% Construction	.03 (.17)*	.04*	.56*	.25 (.50)*	.17*	.37*
% Transportation	.02 (.13)*	.06*	.24*	.00 (.08)	.03*	.14*
% W/R Trades	.01 (.08)	.01	.30*	.04 (.19)*	.01	.32*
Median F. Income	.07 (.27)*	.14*	.63*	.14 (.37)*	.08*	.43*
Median Education	.08 (.28)*	.09*	.31*	.05 (.23)*	.07*	.22*
% Expend/Education	.02 (.13)*	.06*	.11*	.01 (.12)	.10*	.13*
% Expend/Welfare	.02 (-.16)*	.02	.08	.00 (.04)	.00	.03
% Expend/Health	.00 (-.04)	.02	.07	.01 (-.09)	.03*	.04
Per Capita Expenditure	.09 (-.29)*	.12*	.55*	.09 (-.29)*	.09*	.30*
% Services	---	---	---	.03 (.16)*	.18*	.46*

Table 4: Coefficients (r^2) and Multiple Coefficients of Determination (R^2) for Regression of Total Net Migration Rates, Migration Clusters and Age-Specific Net Migration Rates for 1960-70 and 1970-80 on Residuals (Regressing 1980 variable values on 1970 variable values) for Selected Social and Economic Variables

Dependent Variables	1960-1970			1970-1980		
	Total Rate	Clusters	Age-Specific Rates	Total Rate	Clusters	Age-Specific Rates
	r^2 (r)	R^2	R^2	r^2 (r)	R^2	R^2
Number Employed	.05 (.23)*	.12*	.12*	.09 (.30)*	.06*	.11*
% Unemployed	.01 (-.09)	.03	.11*	.01 (.10)	.04*	.15*
% Agriculture	.23 (-.48)*	.28*	.44*	.06 (-.25)*	.03*	.15*
% Manufacturing	.02 (.15)*	.08*	.13*	.01 (-.09)	.03*	.08
% Construction	.01 (.12)*	.03	.60*	.22 (.47)*	.14*	.34*
% Transportation	.04 (.19)*	.05*	.30*	.02 (.13)*	.03*	.15*
% W/R Trade	.00 (.04)	.02	.20*	.06 (.24)*	.03*	.26*
Median F. Income	.18 (.42)*	.19*	.64*	.33 (.58)*	.21*	.42*
Median Education	.23 (.48)*	.23*	.35*	.12 (.36)*	.16*	.30*
% Expend/Education	.01 (.11)	.03	.09	.00 (.02)	.05*	.13*
% Expend/Welfare	.01 (-.11)	.01	.09	.01 (.10)	.01	.06
% Expend/Health	.00 (-.01)	.00	.05	.00 (-.06)	.01	.06
Per Capita Expenditure	.02 (-.14)*	.02	.44*	.03 (-.17)*	.04*	.16*
% Services	---	---	---	.00 (.03)	.02	.24*